AMENDMENT TO THE CLAIMS

1. (Currently amended) An integrated circuit comprising:

a substrate comprising a lower layer and an upper layer on the lower layer;

an array of pixel cells at a surface of the upper layer, each pixel cell comprising a photo-conversion device; and

a trench structure around at least a portion of the array, wherein the trench structure extends from the surface to the lower layer, and wherein the trench structure prevents at least a portion of photons or charged particles from passing through the trench structure to the array wherein said trench structure has a top width and a base layer width and the base layer width is smaller than the top width wherein the trench structure has sidewalls and contains a first material that prevents at least a portion of photons or charged particles from passing through the trench structure to the array.

2. (Canceled)

3. (Currently Amended) The integrated circuit of claim 1~~2~~, further comprising a liner formed along at least a portion of the sidewalls.

4. (Original) The integrated circuit of claim 3, wherein the liner is a high absorption material.

5. (Currently Amended) The integrated circuit of claim 1~~2~~, further comprising a thermal oxide on the sidewalls of the trench structure.

6. (Currently Amended) The integrated circuit of claim 12, wherein the first material is selected from the group consisting of doped polysilicon, undoped polysilicon and boron-doped carbon.

7. (Currently Amended) The integrated circuit of claim 12, further comprising a second material that partially fills the trench structure, wherein the second material prevents at least a portion of photons or charged particles from passing through the trench structure to the array.

8. (Original) The integrated circuit of claim 7, wherein the second material has a higher refractive index than that of the first material.

9. (Original) The integrated circuit of claim 7, further comprising a third material that partially fills the trench structure, wherein the third material prevents at least a portion of photons or charged particles from passing through the trench structure to the array.

10. (Original) The integrated circuit of claim 9, wherein the third material has a higher refractive index than that of the second material.

11. (Original) The integrated circuit of claim 1, wherein the trench structure has a depth of about 4μm to about 6μm.

12. (Original) The integrated circuit of claim 1, wherein the integrated circuit comprises one of a CMOS image sensor and a CCD image sensor.

13. (Withdrawn) A structure for isolating an active area of an integrated circuit, the structure comprising:

a trench formed in a substrate of the integrated circuit along at least a portion of a periphery of the active area, the substrate having a lower layer and an upper layer on the lower layer, wherein the trench extends from a surface of the upper layer to a surface of the lower layer and the trench includes a top width and a base layer width where the base layer width is smaller than the top width;

an insulating liner formed along sidewalls of the trench; and

a first fill material formed over the insulating liner wherein the first fill material at least partially fills the trench and prevents at least a portion of photons and electrons from passing through the trench to the active area.

14. (Withdrawn) The structure of claim 13, wherein the insulating liner is a high absorption material.

15. (Withdrawn) The structure of claim 13, further comprising a thermal oxide material on the sidewalls of the trench.

16. (Withdrawn) The structure of claim 13, wherein the first fill material is an attenuating material that absorbs photons.

17. (Withdrawn) The structure of claim 16, wherein the first fill material comprises one of doped polysilicon, undoped polysilicon and boron-doped carbon.

18. (Withdrawn) The structure of claim 13, wherein the trench has a depth of about 4μm to about 6μm.

19. (Withdrawn) The structure of claim 13, further comprising a second fill material that partially fills the trench, wherein the second material prevents at least a portion of photons from passing through the trench.

20. (Withdrawn) The structure of claim 19, wherein the second fill material has a higher refractive index than that of the first material and is deposited over the surface of the first fill material.

21. (Withdrawn) The structure of claim 19, further comprising a third fill material that partially fills the trench, wherein the third fill material prevents at least a portion of photons from passing through the trench.

22. (Withdrawn) The structure of claim 21, wherein the third fill material has a higher refractive index than that of the second material and is deposited over the surface of the second fill material.

23. (Withdrawn) The structure of claim 13, wherein the semiconductor device comprises one of a CMOS image sensor, a CCD image sensor, a DRAM, a flash memory, an SRAM, a microprocessor, a DSP and an ASIC.

24. (Currently amended) A structure for isolating an active area on an integrated circuit, the structure comprising:

a plurality of trenches formed in a substrate of the integrated circuit on at least a portion of a periphery of the active area, wherein a depth of each of the plurality of trenches extends to a surface of a base layer of said substrate and where at least one trench of the plurality of trenches includes a top width and a base layer width where the base layer width is smaller than the top width <u>further comprising an insulating liner formed along each sidewall of the plurality of trenches wherein the insulating liner comprises a high absorption material.</u>

25. (Canceled) .

26. (Cancelled)

27. (Currently amended) The structure according to claim <u>24</u> ~~25~~, wherein the insulating liner comprises a light attenuation film.

28. (Currently amended) The structure according to claim <u>24</u> ~~25~~, wherein the insulating liner comprises a nitride material or alpha carbon material.

29. (Original) The structure according to claim 24, further comprising a first fill material that at least partially fills each of the plurality of trenches and prevents at least a portion of photons or charged particles from passing through the trench.

30. (Original) The structure according to claim 29, wherein the first fill material is a high absorption material.

31. (Original) The structure according to claim 29, wherein the first fill material is a high extinction coefficient material.

32. (Original) The structure according to claim 29, wherein the first fill material is one of doped polysilicon, undoped polysilicon and boron-doped carbon.

33. (Original) The structure according to claim 29, further comprising a second fill material that partially fills each of the plurality of trenches, wherein the second material prevents at least a portion of photons from passing through the trench.

34. (Original) The structure according to claim 33, wherein the second fill material has a higher refractive index than that of the first material.

35. (Original) The structure according to claim 33, further comprising a third fill material that partially fills each of the plurality of trenches, wherein the third fill material prevents at least a portion of photons from passing through the trench.

36. (Original) The structure according to claim 35, wherein the third fill material has a higher refractive index than that of the second material.

37. (Original) The structure according to claim 24, wherein each of the trenches has a depth of about 4μm to about 6μm.

38. (Withdrawn) A processing system, the processing system comprising:

a processor;

an integrated circuit coupled to the processor, the integrated circuit comprising a structure for isolating an active area on the integrated circuit, the structure comprising:

a trench formed in a substrate on at least a portion of a periphery of the active area of the integrated circuit, wherein the trench extends to a surface of a base layer below the substrate, and wherein the trench has sidewalls and the trench includes a top width and a base layer width where the base layer width is smaller than the top width;

an insulating liner formed along the sidewalls; and

a first fill material formed over the insulating liner that at least partially fills the trench and prevents at least a portion of photons or electrons from passing through the trench.

39. (Withdrawn) The processing system of claim 38, wherein the insulating liner is a high absorption material or a thermal oxide material.

40. (Withdrawn) The processing system of claim 38, wherein the first fill material is selected from the group consisting of doped polysilicon, undoped polysilicon and boron-doped carbon.

41. (Withdrawn) The processing system of claim 38, wherein the trench has a depth of about 4μm to about 6μm.

42. (Withdrawn) The processing system of claim 37, further comprising a second fill material that has a higher refractive index than that of the first material.

43. (Withdrawn) The processing system of claim 38, wherein the integrated circuit comprises one of a CMOS image sensor, a CCD image sensor, a DRAM, a flash memory, an SRAM, a microprocessor, a DSP and an ASIC.

44. (Withdrawn) An isolation structure provided at a surface of a substrate between a source area in which at least one of photons and charged particles originate and an active region, the isolation structure comprising:

at least one trench extending from the surface of the substrate into the substrate to a depth of at least about 0.5μm and with a length extending across the surface of the substrate between the source area and the active area and the at least one trench includes a top width and a base layer width where the base layer width is smaller than the top width.

45. (Currently amended) An integrated circuit comprising:

a substrate;

an array of pixel cells at a surface of the substrate, each pixel cell comprising a photo-conversion device; and

at least one trench around at least a portion of the array, wherein the trench extends from the surface of the substrate to a depth of at least about 0.5μm into the substrate and the at least one trench includes a top width and a base layer width where the base layer width is smaller than the top width <u>wherein the at least one trench structure has sidewalls and contains a first material that prevents a portion of photons or charged particles from passing through the trench structure to the array</u>.

46. (Withdrawn) A processing system, the processing system comprising:

a processor;

an integrated circuit coupled to the processor, the integrated circuit comprising a structure for isolating an active area on the integrated circuit, the structure comprising:

a trench extending from a surface of a substrate to a depth of at least about 0.5μm into the substrate and the trench includes a top width and a base layer width where the base layer width is smaller than the top width.

Claims 47-68. (Canceled)

69. (Withdrawn) An integrated circuit comprising:

a substrate comprising a lower layer and an upper layer on the lower layer;

an array of pixel cells at a surface of the upper layer, each pixel cell comprising a photo-conversion device; and

a trench structure around at least a portion of the array, wherein the trench structure:

extends from the surface to the lower layer,

prevents at least a portion of photons or charged particles from passing through the trench structure to the array;

has sidewalls and contains a first material that prevents at least a portion of photons or charged particles from passing through the trench structure to the array; and

contains a second material that partially fills the trench structure, wherein the second material prevents at least a portion of photons or charged particles from passing through the trench structure to the array.

70. (Withdrawn) The integrated circuit of claim 69, wherein the second material has a higher refractive index than that of the first material.

71. (Withdrawn) The integrated circuit of claim 69, further comprising a third material that partially fills the trench structure, wherein the third material prevents at least a portion of photons or charged particles from passing through the trench structure to the array.

72. (Withdrawn) The integrated circuit of claim 71, wherein the third material has a higher refractive index than that of the second material.

73. (Withdrawn) A structure for isolating an active area of an integrated circuit, the structure comprising:

a trench formed in a substrate of the integrated circuit along at least a portion of a periphery of the active area, the substrate having a lower layer and an upper layer on the lower layer, wherein the trench extends from a surface of the upper layer to a surface of the lower layer;

an insulating liner formed along sidewalls of the trench;

a first fill material formed over the insulating liner wherein the first fill material at least partially fills the trench and prevents at least a portion of photons and electrons from passing through the trench to the active area, and

a second fill material that partially fills the trench, wherein the second material prevents at least a portion of photons from passing through the trench.

74. (Withdrawn) The structure of claim 73, wherein the second fill material has a higher refractive index than that of the first material and is deposited over the surface of the first fill material.

75. (Withdrawn) The structure of claim 73, further comprising a third fill material that partially fills the trench, wherein the third fill material prevents at least a portion of photons from passing through the trench.

76. (Withdrawn) The structure of claim 75, wherein the third fill material has a higher refractive index than that of the second material and is deposited over the surface of the second fill material.

77. (Withdrawn) A structure for isolating an active area on an integrated circuit, the structure comprising:

a plurality of trenches formed in a substrate of the integrated circuit on at least a portion of a periphery of the active area, wherein a depth of each of the plurality of trenches extends to a surface of a base layer of said substrate and the plurality of trenches include a first fill material that at least partially fills each of the plurality of

trenches and prevents at least a portion of photons or charged particles from passing through the trench wherein the first fill material is a high extinction coefficient material.

78. (Withdrawn) A structure for isolating an active area on an integrated circuit, the structure comprising:

a plurality of trenches formed in a substrate of the integrated circuit on at least a portion of a periphery of the active area, wherein a depth of each of the plurality of trenches extends to a surface of a base layer of said substrate and the plurality of trenches include:

a first fill material that at least partially fills each of the plurality of trenches and prevents at least a portion of photons or charged particles from passing through the trench; and

a second fill material that partially fills each of the plurality of trenches, wherein the second material prevents at least a portion of photons from passing through the trench.

79. (Withdrawn) The structure according to claim 78, wherein the second fill material has a higher refractive index than that of the first material.

80. (Withdrawn) The structure according to claim 78, further comprising a third fill material that partially fills each of the plurality of trenches, wherein the third fill material prevents at least a portion of photons from passing through the trench.

81. (Withdrawn) The structure according to claim 80, wherein the third fill material has a higher refractive index than that of the second material.

82. (Withdrawn) The processing system of claim 78 wherein said second fill material has a higher refractive index than that of the first material.